

EXPERT SYSTEM FOR REAL-TIME BIOMONITORING OF ENVIRONMENTAL TOXICITY

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Automated biomonitoring systems continuously monitor water quality and provide rapid notification of developing toxicity caused by a wide range of substances. An important goal for biomonitors is to maximize sensitivity to toxicants while minimizing false alarms that may be caused by non-harmful variations in water quality.

Significant improvements in toxicity detection without an increase in false alarms are possible through the use of novel data processing and neural network modeling approaches developed for an automated fish biomonitoring system.

Toxicity detection is based on simultaneous analysis of ventilatory and movement behavior of a group of eight fish (bluegill, *Lepomis macrochirus*) and water quality parameters (pH, dissolved oxygen, temperature, and conductivity). A general neural network model of fish behavior is used that does not need to be re-calibrated for each individual fish. The model can detect abnormal patterns in fish behavior associated with toxicity with a better signal-to-noise ratio than the present statistical approach, while distinguishing between changes in fish behavior due to toxicity or water quality variations.

The automatic data interpretation is a part of Biomonitor Expert, a Windows-based program that addresses all aspects of the biomonitoring process, including data collection and storage, construction of neural network models of toxicity, user-friendly interfaces and remote notification tools. A modular design enables easy re-configuration of the system, inclusion of different data collection and processing schemes, and application to different biomonitoring applications and toxicity sensors.

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